

NO CALCULATOR

Calculus Worksheet 5

This page is due at the end of class – one per group – list all group members.

1. [Maximum mark: 7]

Let $g(x) = 2x \sin x$.

(a) Find $g'(x)$. [4 marks]

(b) Find the gradient of the graph of g at $x = \pi$. [3 marks]

2. [Maximum mark: 6]

The graph of the function $y = f(x)$ passes through the point $\left(\frac{3}{2}, 4\right)$. The gradient function of f is given as $f'(x) = \sin(2x - 3)$. Find $f(x)$.

3. *[Maximum mark: 7]*

Let $g(x) = \frac{\ln x}{x^2}$, for $x > 0$.

(a) Use the quotient rule to show that $g'(x) = \frac{1 - 2 \ln x}{x^3}$. *[4 marks]*

(b) The graph of g has a maximum point at A. Find the x -coordinate of A. *[3 marks]*

HOMEWORK

Do **NOT** write solutions on this page. Any working on this page will **NOT** be marked.

SECTION B

Answer **all** questions on the answer sheets provided. Please start each question on a new page.

4.

[Maximum mark: 16]

The velocity $v \text{ ms}^{-1}$ of a particle at time t seconds, is given by $v = 2t + \cos 2t$, for $0 \leq t \leq 2$.

- (a) Write down the velocity of the particle when $t = 0$. [1 mark]

When $t = k$, the acceleration is zero.

- (b) (i) Show that $k = \frac{\pi}{4}$.

- (ii) Find the exact velocity when $t = \frac{\pi}{4}$. [8 marks]

- (c) When $t < \frac{\pi}{4}$, $\frac{dv}{dt} > 0$ and when $t > \frac{\pi}{4}$, $\frac{dv}{dt} < 0$.

Sketch a graph of v against t . [4 marks]

- (d) Let d be the distance travelled by the particle for $0 \leq t \leq 1$.

- (i) Write down an expression for d .

- (ii) Represent d on your sketch. [3 marks]